Chapter 1

Mission, Organization, and System Description

This chapter provides an overview of the M109A6 howitzer (Paladin) battalion mission, organization, and description of key system components. The Paladin battalion exhibits the agility, initiative, and flexibility to provide timely and accurate fires in support of maneuver forces. The organization of the battalion and the tactics employed reinforce the principles of war and the tenants of Army operations as set forth in FM 100-5, *Operations*. Compared to earlier M109 series howitzers, the Paladin howitzer operates over more widely dispersed areas, processes on board technical firing data, and demonstrates the ability to shoot and scoot without relying on aiming circles and wire lines.

MISSION

1-1. The Paladin battalion strikes throughout the depth of enemy formations to suppress, neutralize, and destroy ground forces, direct fire weapons, indirect fires systems, and air defense systems. The battalion is organized and equipped to perform any of the four standard tactical missions (direct support (DS), general support (GS), general support reinforcing (GSR), and reinforcing (R)) or any nonstandard missions as described in FM 6-20-1, Chapter 1.

BASIC TASKS

1-2. The Paladin battalion performs tasks under the Army universal task list (AUTL) for the tactical level of war as defined for field artillery battalions in FM 6-20-1. The six major task areas for the tactical level AUTL are:

- Deploy/conduct maneuver.
- Develop intelligence.
- Employ fires.
- Perform combat service support (CSS) and sustainment.
- Exercise C2.
- Protect the force.

ORGANIZATION

1-3. The Paladin battalion is organized with a headquarters and headquarters battery (HHB), three firing batteries each with six howitzer sections (3 X 6), and a service battery (Figure 1-1). The HHB and service battery provide command, control, administrative, and service support for organic and attached elements. See FM 6-20-1 for further details on HHB and service battery configurations and functions.

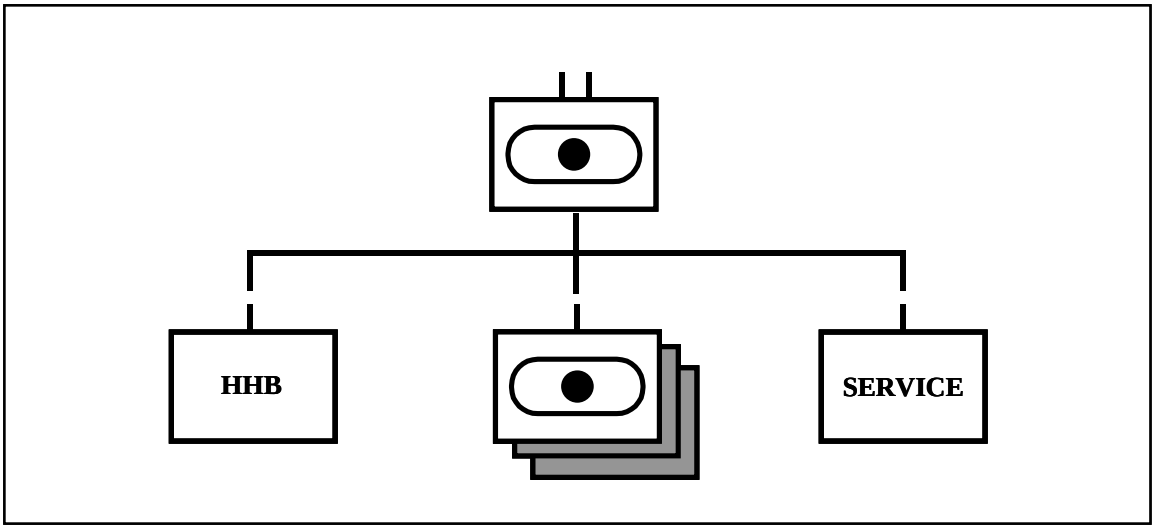

Figure 1-1. Paladin Battalion Organization

1-4. The Paladin firing battery (Figure 1-2) consists of a battery headquarters and two firing platoons. Each firing platoon consists of a platoon headquarters section, a platoon operations center (POC) comprised of fire direction center (FDC) section personnel, three firing sections, and an ammunition section.

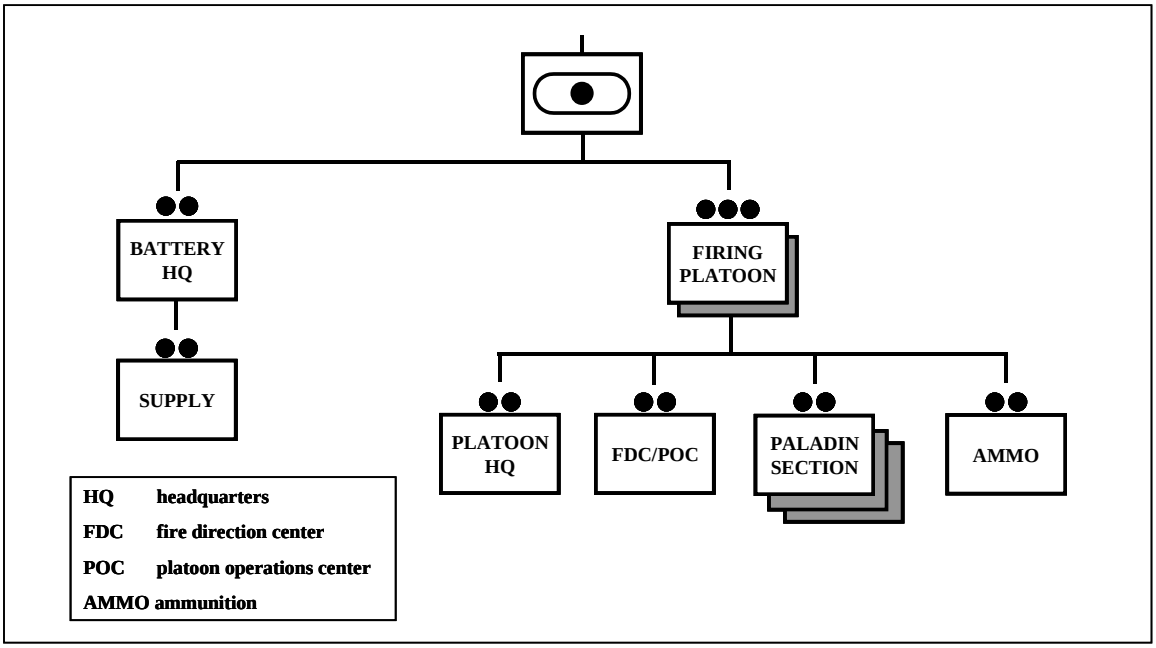

Figure 1-2. Paladin Firing Battery Organization

FORCE XXI ORGANIZATION

1-5. Paladin battalions organized under the Force XXI series table of organization and equipment transition to a four battery per battalion configuration. The battalion consists of a headquarters, headquarters and service (HHS) battery and three firing batteries (Figure 1-3).

1-6. The Force XXI Paladin firing battery consists of a battery headquarters, two firing platoons (each with three firing sections) and a support platoon (Figure 1-4). In the Force XXI battery, a battery operations center (BOC) with FDC takes the place of the two POC elements. The support platoon is comprised of a platoon headquarters, two ammunition sections, a supply section, maintenance section and a food service section. Elements of the support platoon may be consolidated at the battalion level under the HHS, or remain decentralized at battery level.

1-7. The Force XXI Paladin organizational structure is currently undergoing testing. Emerging TTP for Force XXI Paladin organizations may be found in Experimental Forces Special Text 6-70, *Tactics, Techniques, and Procedures for Paladin Operations in the Army XXI Division.*

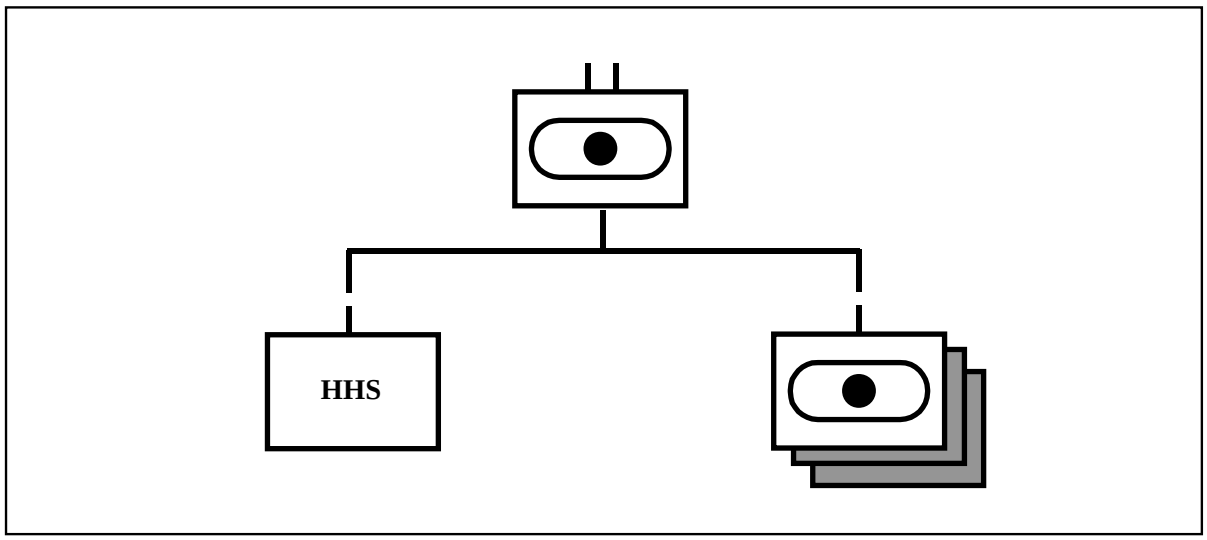

Figure 1-3. Force XXI Paladin Battalion Organization

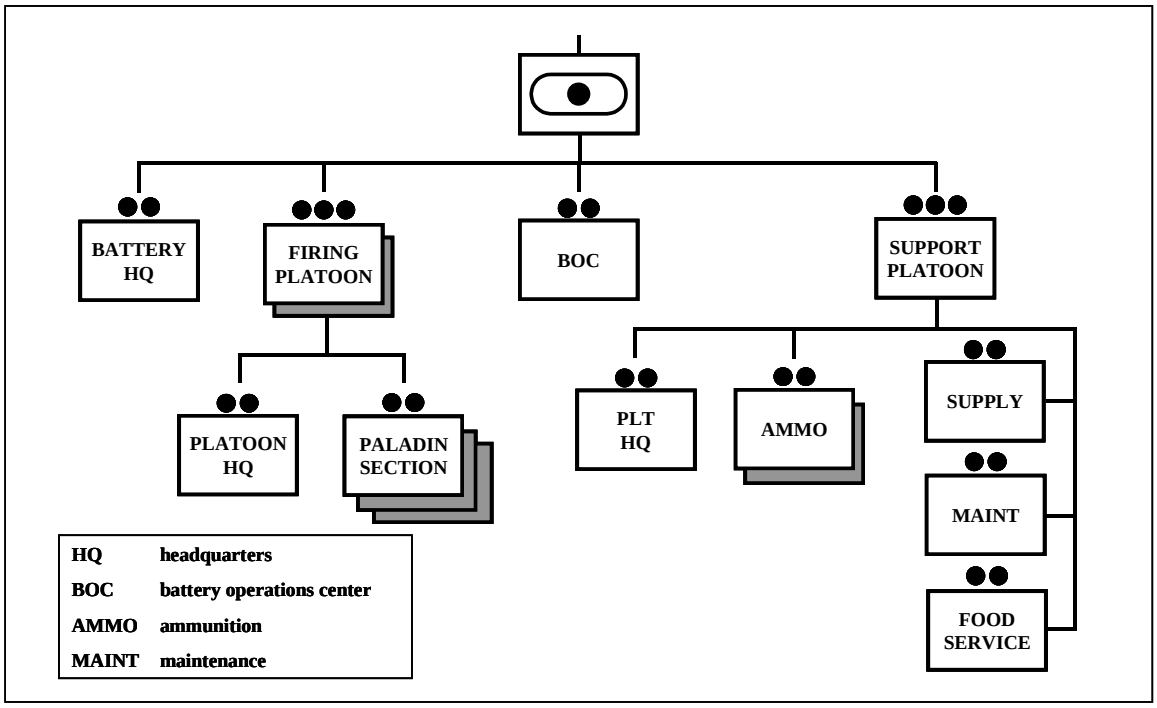

Figure 1-4. Force XXI Paladin Firing Battery Organization

SYSTEM DESCRIPTION

OVERVIEW

1-8. The combination of M109A6 system capabilities and tactics results in more responsive and sustained fires for the maneuver commander compared to earlier M109 series howitzers. The most significant operational differences between the M109A6 and prior M109 series howitzers are the Paladin's ability to operate over a widely dispersed area and to move and emplace using the Paladin technology. Technology advances allow the Paladin to move and position within an assigned area, process technical firing data with the automatic fire control system (AFCS) and single-channel ground and airborne radio system (SINCGARS), and fire a mission without relying on surveyed firing points, aiming circles and wire lines. Howitzers can occupy in more widely varying terrain positions and can repeatedly displace, move, and quickly emplace with faster "ready to fire" times.

1-9. Paladin system responsiveness is enhanced through:

- On-board position navigation.
- On-board technical fire direction.
- Radio communications.
- Freedom from wire.

1-10. Paladin survivability is enhanced through:

- Built-in hardening.

- Dispersion techniques.
- 300-500 meter survivability moves.

1-11. Chapter 3 provides more in depth discussion on Paladin tactical operations. The following paragraphs highlight Paladin system features.

M109A6 PALADIN HOWITZER FEATURES

1-12. The M109A6 Paladin howitzer is the latest product improvement to the original M109 155-millimeter self-propelled (SP) howitzer. The Paladin features improvements in the areas of survivability; reliability, availability, and maintainability (RAM); responsiveness; and terminal effects. Features include an on-board ballistic computer, secure communications, enhanced position and navigation system, an integrated muzzle velocity system (MVS), new turret, improved cannon and mount, improved ballistic and nuclear, chemical, and biological protection, automotive improvements, built-in test equipment (BITE), and driver's night vision capability (Figure 1-5).

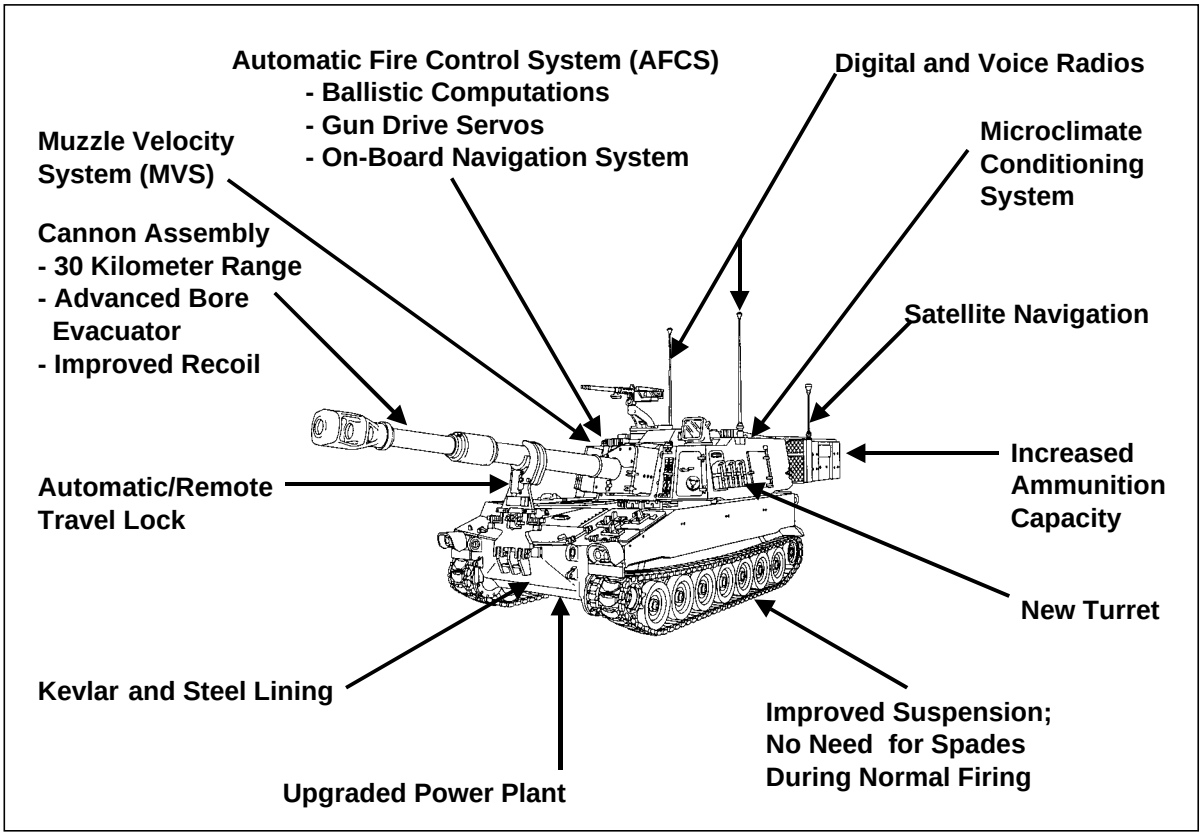

Figure 1-5. Paladin Howitzer Features

1-13. The M109A6 is an armored full-tracked howitzer capable of carrying 37 complete conventional rounds and two Copperhead rounds. A crew of four personnel operates the howitzer. The Paladin's 155 millimeter M284 cannon assembly, fitted with the M182A1 mount, has a maximum range of 30 kilometers (km) when firing a rocket assisted projectile (RAP) using the

M203 series charge (24 km when firing an unassisted projectile). The howitzer has a maximum rate of fire of four rounds per minute for three minutes and a sustained rate of fire of one round per minute. The M109A6 travels at speeds up to 38 miles per hour, has a maximum cruising range of 186 miles, and a fuel capacity of 133 gallons. The Paladin weighs approximately 32 tons combat loaded.

1-14. Survivability improvements include:

- Hull and turret structure with composite spall suppression liners and supplemental armor.
- Remote travel lock allows crew to emplace or displace without dismounting from the howitzer.
- Relocated projectiles.
- Segregated hydraulic components.
- Microclimate conditioning system provides filtered and conditioned air to crew's protective masks and vests.
- A fixed carbon dioxide fire suppression system for the engine compartment and portable units for the crew and driver's compartments.

1-15. RAM improvements include:

- Engine cooling package.
- Sealed starter and protective circuitry.
- New alternator.
- Final drive quick disconnects.
- Upgraded suspension, hydraulic, and electrical systems.
- Added the prognostic/diagnostic interface unit (PDIU), a maintenance diagnostic and limited prognostic testing unit.

1-16. Armament improvements to the cannon include:

- Redesigned interior profile of the gun tube assembly.
- Improved breech and recoil system designed to enhance component life.
- Strengthened muzzle break.
- An advanced bore evacuator.

Automatic Fire Control System (AFCS)

1-17. The AFCS provides position location and directional reference, a ballistic computer for on-board technical fire direction, a muzzle velocity (MV) measuring system, and gun-drive servos, which automatically orient the tube for deflection and quadrant. The AFCS enhancements improve responsiveness and survivability by permitting frequent movement through semi-autonomous operations. Additionally, the AFCS has an embedded training feature, which allows the crew to practice mission scenarios.

1-18. The major components that make up the AFCS include:

- AFCS computer unit (ACU) (includes ballistic computation, weapons control, and communications processing circuit cards).
- Display unit (DU).
- Hydraulic components (manifolds, servo valves, solenoid valve, and pilot check valves).

- System interconnect cabling (military standard 1553 data bus).
- Power conditioner unit (PCU).
- Navigation system with modular azimuth positioning system (MAPS) components.

1-19. The MAPS is made up of modular components combined in different configurations to provide survey and orientation information needs of a particular system. In the Paladin application, major components of MAPS consist of the dynamic reference unit-hybrid (DRU-H), vehicle motion sensor (VMS), and the global positioning system (GPS)/precision lightweight GPS receiver (PLGR).

1-20. The DRU-H is mounted on the right trunnion of the Paladin armament system. Operating in conjunction with PLGR, the DRU-H contains all necessary sensor electronics, processing, and input-output circuitry to perform survey and orientation functions and interface with other MAPS components. The DRU-H performs the following functions:

- Provides vehicle position from a known starting point in terms of universal transverse mercator coordinates of easting, northing, and altitude.
- Provides vehicle orientation in terms of azimuth from grid north.
- Compensates for weapon pitch and cant.
- Supplies angular velocity rates.
- Provides weapon elevation, grid azimuth, azimuth rate, elevation rate, travel local grid azimuth reference, and travel local elevation reference.

1-21. The VMS is a mechanical drive that converts vehicle odometer outputs to electrical signals as a measure of weapon displacement. The VMS, located in the engine compartment, is driven directly from the transmission output drive for the odometer cable. The VMS supplies the electronic information to the VMS modem.

1-22. Note: The M117/M117A2 panoramic telescope (pantel), M145/M145A1 telescope mount, and the M1A1 collimator remain on board the howitzer as backup optical fire control instrumentation.

M992A2 FIELD ARTILLERY AMMUNITION SUPPORT VEHICLE (FAASV) FEATURES

1-23. The M992A2 FAASV accompanies the M109A6 and completes the howitzer section. The FAASV has a crew of five. The M992A2 is a full-tracked, aluminum armored ammunition resupply vehicle with a hydraulic powered conveyor for single-round transfer of ammunition. The M992A2 is comparable to the M109A6 in terms of speed, mobility, and survivability. In addition to ammunition handling equipment, the FAASV features projectile rack assemblies and storage compartments with the capacity to hold 90 complete conventional rounds and 3 copperhead rounds; a diesel powered auxiliary power unit used to drive the hydraulic system and recharge vehicle batteries; and an automatic fire extinguisher system (AFES).

THE PLATOON OPERATIONS CENTER (POC)

1-24. The POC provides battle command for the Paladin platoon. The POC is contained in an M577/M1068 command post vehicle configured to support M109A6 Paladin operations. The lightweight computer unit (LCU) with battery computer system (BCS) software is the primary digital interface between the advanced field artillery tactical data system (AFATDS)/initial fire support automation system (IFSAS) and the howitzers.